Claims

What Is Claimed:

1. An apparatus for sensing at least one force applied to the apparatus, said apparatus comprising:

at least one nanostructure being suitable for emitting electrons; and,

at least one collector proximately positioned with respect to said at least one nanostructure so as to receive said emitted electrons and define at least one gap therebetween that is at least partially dependent upon said applied force;

wherein, said emission and reception of said electrons is indicative of said applied force.

2. The apparatus of Claim 1, further comprising means for applying at least one electrical potential across said gap.

3. The apparatus of Claim 1, wherein said at least one nanostructure and at least one collector are adapted to have at least one electrical potential applied there-across.

4. The apparatus of Claim 3, wherein said at least one nanostructure and collector are operable in a first mode corresponding to a cutoff region for emissions and a second mode corresponding to substantially potential and gap dependent emissions.

5. The apparatus of Claim 4, wherein said electrical potential is adapted to operate said at least one nanostructure in at least one of said modes in a first state and at least one other of said modes in response to said applied force.

6. The apparatus of Claim 4, wherein said at least one nanostructure and collector are operable in a third mode corresponding to a saturation region for emissions.

7. The apparatus of Claim 1, wherein said at least one nanostructure comprises one or more carbon nanotubes suitable for emitting an electron field when electrically excited.

8. The apparatus of Claim 1, wherein said at least one nanostructure comprises at least one film suitable for emitting an electron field when electrically excited and comprising one or more carbon nanotubes.

9. The apparatus of Claim 1, wherein said at least one nanostructure comprises at least one self aligned carbon nanotube.

10. The apparatus of Claim 1, wherein said at least one nanostructure comprises at least one array of self aligned carbon nanotubes.

11. The apparatus of Claim 1, wherein at least a portion of said at least one nanostructure is adapted to be displaced in response to said applied force.

12. The apparatus of Claim 1, wherein said at least one nanostructure provides a proof mass for sensing said applied force.

13. The apparatus of Claim 12, wherein said at least one nanostructure is adapted to provide said proof mass.

14. The apparatus of Claim 13, further comprising a predetermined mass affixed to said at least one nanostructure.

15. The apparatus of Claim 13, wherein a mass of said at least one nanostructure is increased by molecular absorption of at least one substance to provide said proof mass.

16. The apparatus of Claim 15, wherein said at least one nanostructure further comprises hydrogen.

17. The apparatus of Claim 1, further comprising at least one current sensor electrically coupled to said at least one collector and for detecting at least one current being indicative of said emission and collection.

18. The apparatus of Claim 1, further comprising a plurality of collectors each being proximately positioned with respect to said at least one nanostructure so as to receive said emitted electrons and define at least one corresponding gap therebetween that is at least partially dependent upon said applied force.

19. The apparatus of Claim 1, further comprising at least one current sensor electrically coupled to each said collector and for detecting at least one current being indicative of said emission and collection.

20. The apparatus of Claim 1, wherein said at least one collector detects said emissions using thermal detection.

21. The apparatus of Claim 1, wherein said at least one collector detects said emissions using spectral re-emission of energy, wherein said spectral re-emission is at least partially dependent upon an energy associated with electrons impacting said collector.

22. The apparatus of Claim 1, wherein the gap is configured such that there is substantially no field emission in an absence of said applied force.

23. The apparatus of Claim 1, further comprising:

means for applying at least one electrical potential across said gap; and,

means for measuring an electron current being indicative of said applied force between said at least one collector and said means for applying at least one electrical potential across said gap.

24. The apparatus of Claim 23, wherein said at least one electrical potential across said gap is substantially constant.

25. The apparatus of Claim 1, wherein at least said at least one nanostructure and collector are in a substantial vacuum chamber.

26. The apparatus of Claim 1, further comprising a deflectable member supporting said at least one collector, wherein said gap is at least partially dependent upon deflection of said deflectable beam.

27. The apparatus of Claim 26, further comprising at least one support physically coupling said at least one nanostructure to said at least one collector.

28. The apparatus of Claim 27, further comprising a proof mass mechanically coupled to said member.

29. The apparatus of Claim 28, wherein said member is mechanically coupled to said at least one support in a cantilevered manner.

30. The apparatus of Claim 28, wherein said member is simply supported by said at least one support.

31. The apparatus of Claim 28, wherein said member is fixedly coupled to said at least one support.

32. The apparatus of Claim 26, wherein said member comprises at least one beam.

33. The apparatus of Claim 26, wherein said at least one member comprises at least one deflectable membrane.

34. The apparatus of Claim 33, wherein said membrane is suitable for deflecting in response to a pressure applied thereto.

35. The apparatus of Claim 34, wherein said applied force corresponds to said applied pressure.

36. The apparatus of Claim 35, further comprising a compartment containing at least one of a fluid and a gas exerting said pressure

37. The apparatus of Claim 36, wherein said compartment form at least a portion of a tank, pipe, cavity or channel for fluid or gas transport.

38. A method for sensing at least one applied force, said method comprising:

receiving emissions from at least one nanostructure using at least one collector proximately positioned with respect to said at least one nanostructure; and,

sensing at least one current associated with said at least one collector;

wherein, said sensed current is indicative of said applied force.

39. The method of Claim 38, further comprising the step of applying at least one electrical potential across a gap between said at least one collector and at least one nanostructure.

40. The method of Claim 38, further comprising the step of applying at least one electrical potential across said at least one nanostructure and collector.

41. The method of Claim 40, wherein said at least one nanostructure and collector are operable in a first mode corresponding to a cutoff region for emissions and a second mode corresponding to substantially potential and gap dependent emissions.

42. The method of Claim 41, wherein said electrical potential is adapted to operate said at least one nanostructure in at least one of said modes in a first state and at least one other of said modes in response to said applied force.

43. The method of Claim 41, wherein said at least one nanostructure and collector are operable in a third mode corresponding to a saturation region for emissions.

44. The method of Claim 38, wherein said at least one nanostructure comprises one or more carbon nanotubes suitable for emitting an electron field when electrically excited.

45. The method of Claim 38, wherein said at least one nanostructure comprises at least one film suitable for emitting an electron field when electrically excited and comprising one or more carbon nanotubes.

46. The method of Claim 38, wherein said at least one nanostructure comprises at least one self aligned carbon nanotube.

47. The method of Claim 38, wherein said at least one nanostructure comprises at least one array of self aligned carbon nanotubes.

48. The method of Claim 38, wherein at least a portion of said at least one nanostructure is adapted to be displaced in response to said applied force.

49. The method of Claim 38, wherein said at least one nanostructure provides a proof mass for sensing said applied force.

50. The method of Claim 38, wherein said at least one nanostructure is adapted to provide said proof mass.

51. The method of Claim 39, wherein the gap is configured such that there is substantially no field emission in an absence of said applied force.

52. The method of Claim 39, further comprising the step of applying at least one substantially constant electrical potential across said gap.

53. The method of Claim 38, wherein said applied force takes the form of a pressure deflecting at least one membrane at least partially supporting said at least one collector.

54. The method of Claim 38, further comprising the step of sensing a plurality of currents associated with a plurality of collectors each being proximately positioned with respect to said at least one nanostructure .

55. An accelerometer comprising:

at least one nanostructure being suitable for emitting electrons in response to application of at least one potential; and,

a collector positioned with respect to said at least one nanostructure to sense said emitted electrons upon application of said potential;

wherein, said at least one nanostructure is sufficiently and at least partially displaceable with respect to said collector such that displacement of said at least one nanostructure with respect to said collector is indicative of at least one acceleration.

56. The accelerometer of Claim 55, further comprising means for applying said potential between said at least one nanostructure and collector.

57. The accelerometer of Claim 55, wherein said at least one nanostructure and collector are operable in a first mode corresponding to a cutoff region for emissions and a second mode corresponding to substantially displacement dependent emissions.

58. The accelerometer of Claim 57, wherein said potential is suitable for operate said at least one nanostructure in at least one of said modes in a first state and at least one other of said modes in response to said applied force.

59. The accelerometer of Claim 58, wherein said at least one nanostructure comprises one or more carbon nanotubes suitable for emitting an electron field when electrically excited.

60. The accelerometer of Claim 55, wherein said at least one nanostructure comprises at least one film suitable for emitting an electron field when electrically excited and comprising one or more carbon nanotubes.

61. The accelerometer of Claim 55, wherein said at least one nanostructure comprises at least one carbon nanotube having ends affixed to at least one substrate.

62. The accelerometer of Claim 55, wherein said at least one nanostructure comprises at least one array of self aligned carbon nanotubes.

63. The accelerometer of Claim 55, wherein said at least one nanostructure provides a proof mass.

64. The accelerometer of Claim 55, further comprising a predetermined mass affixed to said at least one nanostructure.

65. The accelerometer of Claim 55, wherein a mass of said at least one nanostructure is at least partially dependent upon at least one molecularly absorbed substance.

66. The accelerometer of Claim 55, wherein said at least one nanostructure further comprises hydrogen.

67. The accelerometer of Claim 55, further comprising at least one current sensor electrically coupled to said at least one collector and being suitable for detecting at least one current being indicative of said emission and collection.

68. The accelerometer of Claim 55, wherein said at least one collector comprises a plurality of collectors each being proximately positioned with respect to said at least one nanostructure so as to receive said emitted electrons and define at least one corresponding gap there between that is at least partially dependent upon said applied force.

69. A field emission based sensing device comprising:

a plurality of nanostructures; and,

at least one sensor proximately positioned with respect to said nanostructures and being suitable for receiving field emissions from said nanostructures based upon application of a bias across said sensor and nanostructures and at least partial displacement of said nanostructures with respect to said sensor.

70. The Field emission based sensory device of Claim 69, further comprising at least one excitation pad electrically coupled to at least over of said plurality of nanostructures.

71. The Field emission based sensory device of Claim 69, wherein said at least one sensor comprises a plurality of sensors.

72. The Field emission based sensory device of Claim 71, wherein each of said sensors comprises at lease one collector.